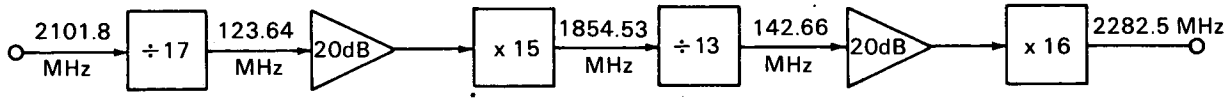
July 1967 Brief 67-10250

NASA TECH BRIEF

Experimental Coherent Fractional Frequency Multiplier at S-Band



The problem:

To develop an efficient fractional frequency multiplier that will operate on a 5.6 mw, 2101.8 MHz input signal to achieve an output-to-input frequency ratio of 240/221.

The solution:

An experimental circuit employing step-recovery diodes in all frequency-changing stages (frequency division and harmonic generation) to obtain a desired coherent offset frequency by strictly harmonic and subharmonic operations. It is basically a system that phase-locks a derived frequency to the input frequency without servo loops. No oscillator stages are required, and the only power requirement of the system (other than the input signal) is less than 180 mw of dc to two transistor amplifiers operating at VHF.

How it's done:

The input frequency (2101.8 MHz) is divided by 17 in a single-stage step-recovery subharmonic generator, providing a 123.64 MHz signal. The amplified signal then passes to an X15 high-order step-recovery multiplier. The resulting 1854.53 MHz signal is divided by 13 to yield a 142.66 MHz signal. This signal is amplified and fed to an X16 multiplier, which provides the 2282.5 MHz output (at 4.3 mw) required to satisfy the output-to-input frequency ratio of 240/221.

The high-order step-recovery subharmonic generators each employ one idler circuit operating at the difference frequency between the input and output frequencies of the particular stage. The high-order multipliers are based on familiar circuitry involving no idler. Reentrant cavity filters and lumped-constant networks are used for matching and frequency selection. The entire system is capable of being frequency-modulated without loss of frequency-locking of the subharmonic and harmonic generator stages.

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10250

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: R. A. Mostrum
of Smith Electronics Inc.
under contract to
Marshall Space Flight Center
(M-FS-2427)

Category 01